REMARKS

Applicant has amended claims 1, 7, 12, and 15. The amendments to claims 1, 7, 12, and 15 have not been made to overcome the rejections in the Office Action. Specifically, the amendments to claims 1, 7, 12, and 15 are non-narrowing amendments and not amendments for patentability to overcome any prior art. Applicant has also added new claim 21. Applicant respectfully requests reconsideration of this application in view of the following remarks and the remarks in the previous response filed on April 29, 2002.

35 USC §103 Rejections

The Office Action rejects claims 1 – 20 per 35 USC §103(a) as being unpatentable over Aleksic et al. 6,175, 368 (the Aleksic '368 patent).

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). (Manual of Patent Examing Procedure (MPEP) ¶ 2143.03).

Applicant disagrees with the Office Action and asserts that the Aleksic '368 patent does not teach 1) use of color values for bump mapping and 2) using angle coordinates for bump mapping.

<u>1) Use of Color Values for Bump Mapping</u>

<u>a) Bump Intensity Values are not Color Values</u>

The Aleksic '368 patent does not teach "generating a table of <u>color values</u> to be referenced by orientation-dependent color variables" as in claim 1; "<u>color values</u> for a sample of vector orientations" as in claim 7, 15, 18 and 21; or "generating <u>color values</u> for a sample of normal vector orientations" as in claim 12.

The Office Action mistakenly asserts that the look-up tables described in the Aleksic '368 patent contain color values when referring to col. 3, lines 11 – 14 of the Aleksic '368 patent. This citation describes, "a first and second axis specific tables...generated to provide a plurality of axis specific bump intensity values" (col. 2, lines 55 – 57). Bump intensity values are variations in shading affect and <u>are not</u> color values. The Aleksic '368 patent repeatedly refers to these axis specific bump intensity tables, but does not teach using color values for bump mapping.

Although the Aleksic '368 patent mentions color information, the color information described in the Aleksic '368 patent is not a color variable or a color value. Even if the color information or color data briefly mentioned in the Aleksic '368 patent is similar to Applicant's color value or color variable, which it is not, the Aleksic '368 patent does not describe color information for use in bump mapping. After bump mapping has already been performed, the Aleksic '368 patent describes combining "the resulting shading function with the color information 46, and the texel information 48 to produce display data 50 for a given pixel" (col. 4, lines 22 – 34).

<u>b) Determining a Color Value for a Pixel</u>

The Aleksic '368 patent also does not teach "assigning the pixel a color value from the table of color values according to the one or more color variables" as in claim 1; "assign a color value from the color map to each pixel according to its one or more color variables" as in claim 7; "retrieving at least one of the color values for the pixel according to the perturbed first and second angle coordinates" as in claim 12; "provide at least one of the color values for each pixel with the perturbed color variable" as in claim 15; "retrieving a color value for the pixel according to the perturbed first and second angle coordinates" as in claim 18; or "assigning at least one of the plurality of color values to the pixel in accordance with the color variable" as in claim 21.

The Aleksic '368 patent does not describe assigning or retrieving a color value for a pixel. In addition, the Aleksic '368 patent never describes a relationship between a color value and angle coordinates.

2) Use of Angle Coordinates for Bump Mapping

The Aleksic '368 patent does not teach use of angle coordinates for bump mapping as found in independent claims 1, 7, 12, 15, 18, and 21. The "physical coordinates" described in the Aleksic '368 patent are Cartesian coordinates. Applicant's claimed invention performs interpolation with angle coordinates and not Cartesian coordinates. With angle coordinates, interpolation, which is also not described in the Aleksic '368 patent, Applicant's claimed invention is able to achieve relatively high quality shading (e.g., Fast Phong shading) for bump mapping without being hindered by the relatively complex calculations that would result from using Cartesian coordinates.

In light of the above arguments, claims 1, 7, 12, 15, 18 and 21 should be allowed.

Claims 1 - 21 are currently pending in the referenced application.

3) Remaining Claims

Applicant respectfully traverses all rejections made with respect to the dependent claims. Applicant asserts that all dependent claims of the application are dependent on one of the above allowable independent claims.

CONCLUSION

Applicant respectfully requests reconsideration of this application as amended. Applicant respectfully submits that the Claims are novel, and nonobvious over the cited prior art for the above reasons and are in condition for allowance. Accordingly, Applicant respectfully requests the rejections be withdrawn and the Claims be allowed.

INVITATION FOR A TELEPHONE INTERVIEW

The Examiner is hereby invited to contact the undersigned at (512) 330-0844 if there remains any issue with allowance of this case.

CHARGE OUR DEPOSIT ACCOUNT

Please charge any shortage in connection with this communication to our Deposit Account No. 02-2666.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

New Claims 21 – 22 have been added.

The following claims have been amended as follows:

1. (Thrice Amended) A method for implementing bump mapping, comprising:

generating a table of color values to be referenced by orientation-dependent color variables;

determining first and second vertex angle coordinates for a vertex vector;

interpolating the first and second vertex angle coordinates to provide first and second angle coordinates for each pixel in a polygon, the first and second angle coordinates representing a direction of the vertex vector at the pixel;

modifying the estimated angle coordinates, using a perturbation source;
converting the modified angle coordinates to one or more color variables; and

assigning the pixel a color value from the table of color values according to the one or more color variables.

7. (Thrice Amended) A graphics system comprising:

a geometry engine to associate vector orientation data with vertices of one or more polygons representing an object in an image;

a color map including color values for a sample of vector orientations, each color value to be~~being~~ referenced by one or more orientation dependent color variables;

a perturbation source to provide orientation perturbations; and

a rendering engine to convert a vertex vector and a vertex perturbation to a pair of vertex angles and a pair of vertex perturbation values, respectively, estimate pairs of angle coordinates and perturbation coordinates for each pixel in the polygon from the pairs of vertex angles and perturbation values, respectively, generate one or more perturbed color variables using the pairs of angle coordinates and

perturbation coordinates, and assign a color value from the color map to each pixel according to its one or more color variables.

12. (Thrice Amended) A machine readable medium on which are stored instructions that are executable by a system to implement a method for assigning a color value to an image pixel, the method comprising:

generating color values for a sample of normal vector orientations, each color value being associated with one or more scaled angle coordinates representing a corresponding normal vector orientation;

estimating first and second angle coordinates for the pixel from angle coordinates associated with a vertex vector;

perturbing the first and second angle coordinates to provide modified first and second angle coordinates; and

retrieving at least one of the ~~a~~ color values for the pixel according to the perturbed first and second angle coordinates.

15. (Thrice Amended) A graphics system comprising:

means for associating a plurality of vertex angles with each vertex of one or more polygons representing an object in an image;

means for indicating color values for a sample of vector orientations, each color value to be ~~being~~ referenced by one or more orientation dependent color variables;

means for providing orientation perturbations; and

means for converting the plurality of vertex angles for each polygon to a plurality of angle coordinates and perturbation coordinates for each pixel in the polygon; and

means for combining the angle and perturbation coordinates to generate a perturbed color variable and to provide at least one of the color values for each pixel with the ~~through~~ perturbed color variable.